

PREFACE

Considerable information on flood proofing exists. This information is generally in the form of brochures, booklets, or reports describing the various flood proofing measures, where the measures should be used, and how to design flood proofed structures. The U.S. Army Corps of Engineers' National Flood Proofing Committee (NFPC) has recognized the need for information that describes how flood proofing measures perform when they are actually tested by floodwater. The NFPC originally solicited such information from Federal and State agencies and other organizations; however, the request resulted in little information. As a result, the NFPC acquired information by visiting various selected flooded areas across the United States. Flood proofed structures located within those flooded areas were inspected to determine the performance of flood proofing measures. The NFPC documented the results of its information-gathering effort into this report, which describes actual flood proofed structures and how floodwater affected those structures. With each specific case described, a "lesson" is presented to briefly describe what worked and what did not.

DATA COLLECTION

Data on 12 floods were collected. The flood locations and dates of these floods are as follows:

- Clive, Iowa - May 1986
- Central Michigan - September 1986
- Crystal City, Minnesota - July 1987
- Montgomery County, Texas - May/June 1989
- Central Coast, South Carolina - September 1989
- St. Louis, Missouri, and Vicinity - Summer 1993
- Central Iowa - Summer 1993
- Southeastern Texas - October 1994
- Florida Panhandle - Fall 1995
- Eastern California and Western Nevada - January 1997
- Lower Platte River, Nebraska - February 1997
- Red River of the North, Minnesota and North Dakota - April 1997

Data collected to date range over a number of years and include both riverine and coastal flooding. Data prior to 1993 were taken from four flood damage assessment reports developed by URS Corporation for the Federal Emergency Management Agency (FEMA). Sites included in these reports have not been visited by a member of the NFPC. Lessons learned from data collected at these sites were developed by an engineer reviewing the data for each structure based on the effectiveness of the flood proofing measures. Subsequent to 1992, all data were collected by the NFPC. Data collection methodology involved keeping informed about

significant flooding events across the United States. Upon the occurrence of flooding, NFPC members placed telephone calls to local Corps of Engineers offices to determine the possibility of flood proofed structures existing in the flooded areas. With the information provided, a decision was made whether or not to visit the flooded area. Not every flooded area across the United States could be visited because of funding limitations, the low possibility of flood proofed structures being present in the flooded area, and the lack of need to inspect and collect data on every flood proofed structure tested by flooding. Initial data collection efforts depended primarily on contacting local officials in selected communities for information on flood proofed structures. This procedure was eventually modified in order to gain more needed information. The procedure evolved to the current procedure: locating the flooded areas, having an experienced engineer drive through the flooded areas searching for flood proofed structures, and visiting with residents of the flooded areas. When a flood proofed structure tested by floodwater was located, the engineer made a personal inspection of the site to determine what worked and what did not in regard to the flood proofing measures.

DATA ANALYSIS

Data analysis was accomplished by an experienced engineer, primarily through analysis of the structure during the onsite inspection and during the subsequent in-office reviews of the data collected. During the onsite field inspection, the engineer looked for reasons why the particular measure was successful or why it failed, if indeed it did fail. In most flood proofing applications where failure occurred, usually only one or two mistakes were made that caused the flood proofing measure to fail.

LESSONS

The “lessons learned” portion of this report is the most important part. The intent of this report is to clearly identify what caused a flood proofing project to either succeed or fail. This is done by making simple statements based on analytical observation rather than rigorous analytical computation. These lessons are summarized in the form of “Do’s and Don’ts” of flood proofing.

FUTURE WORK

While a considerable amount of good information has been gathered, more information on successes and failures of flood proofed structures is needed. Information on dry and wet flood proofing measures is especially needed. The NFPC is requesting that any information on flood proofed structures, such as those described in this report, be forwarded to the following individual: Mr. Larry Buss, P.E., U.S. Army Corps of Engineers, ATTN.: CENWO-ED-HB, 215 N. 17th St., Omaha, NE 68102-4978 (e-mail address: larry.s.buss@usace.army.mil). The NFPC intends to continue this project until enough information is obtained to provide an adequate range of successes and failures of all flood proofing measures actually tested by floodwater. This is a national effort, and information is requested from all entities.

PERSPECTIVE

This report documents the performance of flood proofed structures that have been tested by floodwater. As part of this documentation, the report focuses on what components of the flood proofing measure were “key” to the success or failure of the measure. The NFPC quickly found that in many cases more could be learned from a failed measure than from a successful measure. Based on this and the purpose of this report which is to provide as much information as possible to make flood proofing successful, more failed measures are documented than successful measures. This report wants to emphasize that the vast majority of flood proofing measures are successful and that flood proofing is a very viable measure for reducing future flood damage.

REPORT CONTENT

The report is organized into five chapters. **Chapter 1** contains an introduction to flood proofing. It discusses flood proofing objectives; flood proofing measures; and flood, site, and structure characteristics that need to be assessed to implement successful flood proofing.

Chapter 2 contains a very brief description of each observed flood event, structure, and flood proofing measure used, as well as a “lesson.” The “lesson” is very important since it points out what worked well and what did not according to the flood proofing measure used.

Chapter 3 contains, in tabular form, the following information on each structure observed:

- ! Structure number
- ! Structure location by community
- ! Structure type
- ! Flood source (riverine or coastal)
- ! Flood date
- ! Flood proofing measure used
- ! Performance of the flood proofing measure used

Two separate tables showing the above information are presented. Table 1 is listed in order of community and Table 2 in order of flood proofing measure used. This allows rapid location of information by both community and flood proofing measure.

Chapter 4 contains a summary of the “lesson” portion of Chapter 2. It contains the basic “Do’s and Don’ts” related to flood proofing. The intent of this chapter is a quick reference of items that must be considered to make a flood proofing measure successful.

Chapter 5 contains a glossary to acquaint the reader with terms used in the report.